



## Case Report

## Crossbow injuries: A case report

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## ABSTRACT

Despite the increasing popularity of crossbows in recreational hunting, injuries and deaths from crossbows are still relatively rare. In suicides, the body areas favoured are similar to those of gun users, namely the thorax and head. These deaths almost always occur in males. The case presented is that of a 49 year old male with a history of mental illness and suicidal attempts, who committed suicide with a crossbow. The weapon was discharged into the left thorax. Examination of crossbow injuries can be difficult due to their similarities with other incised wound patterns. As many victims may survive for some time after injury, removal of the bolt is possible. As well, removal of the bolt followed by advanced decomposition may alter the wound patterns. Careful examination of clothing, as well as entry wound reconstruction may give an indication to the weaponry used. Radiology is useful for detecting debris along the wound path, as well as position of the bolt when it is in situ. Finally, when dealing with cases of crossbow head injuries, consideration of both blood loss as well as diffuse axonal damage is important, both in non-fatal and fatal cases.

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## 1. Introduction

Traumatic injury due to crossbows is a rare occurrence these days. Although most injuries fall within an accidental category, such as a hunting trip gone awry, there are cases involving homicide and suicide by crossbow, with homicide being a rarity. Most individuals who commit suicide by crossbow tend to be male. The most common anatomical sites of entry tend to be the thorax and the skull. This paper will present the case of a middle-aged male, who committed suicide by crossbow. This will be followed by a review of other suicidal and homicidal cases involving crossbow injuries.

## 2. Case report

A 49 year old male with a documented history of mental illness and suicide attempts, was found dead, lying in a supine position on the floor at home. There were decompositional changes including green discolouration of the skin, marbling, and bloating. A hunting bolt had penetrated the left side of the thorax (Fig. 1), and a crossbow lay next to the deceased (Fig. 2).

The entry wound was superior to the left nipple, and approximately 4.5 cm to the left of the midline. Direction of the wound was posterior, slightly right to left (approximately 80 degrees from the right in the horizontal plane), and slightly downward. After re-

moval of the bolt, the edges of the wound were approximated. The entry wound was in the form of a triple radial, smooth-sided cut, with lengths of between 1.5 and 2 cm after reconstruction of the wound edges. This wound pattern correlated with a three bladed bolt tip (consistent to those found at the scene and recovered from the wound path). The bolt passed through the fourth intercostal space, and terminated in the left lung, at the level of the fifth intercostal space. There was no exit wound. The wound tract was approximately 20 cm in total length. There was no injury to the heart. The cause of death was attributed to blood loss.

The weapon used was a crossbow with mounting apparatus for a telescopic site (absent). The total length of the weapon was 84 cm, and the length from the trigger to end of the firing shaft was 41 cm. The hunting bolt measured 40 cm, and had a three bladed tip arranged in a radial pattern.

## 3. Discussion

The use of the crossbow and 'bow and arrow' type weaponry has extended over the millennia. The crossbow was probably introduced to England via the Normans sometime after 1066 AD, and was a popular weapon up until the 16th century, with the advent of firearms [1]. In contemporary times, the crossbow is becoming an increasingly popular hunting weapon, as 'bow-hunting' season in many jurisdictions extends over a much longer season than rifle hunting. As well, crossbows are much easier to attain (in most countries) compared to firearms, which require a lengthy application process and licensing laws.

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**Fig. 1.** In situ bolt in left thorax.

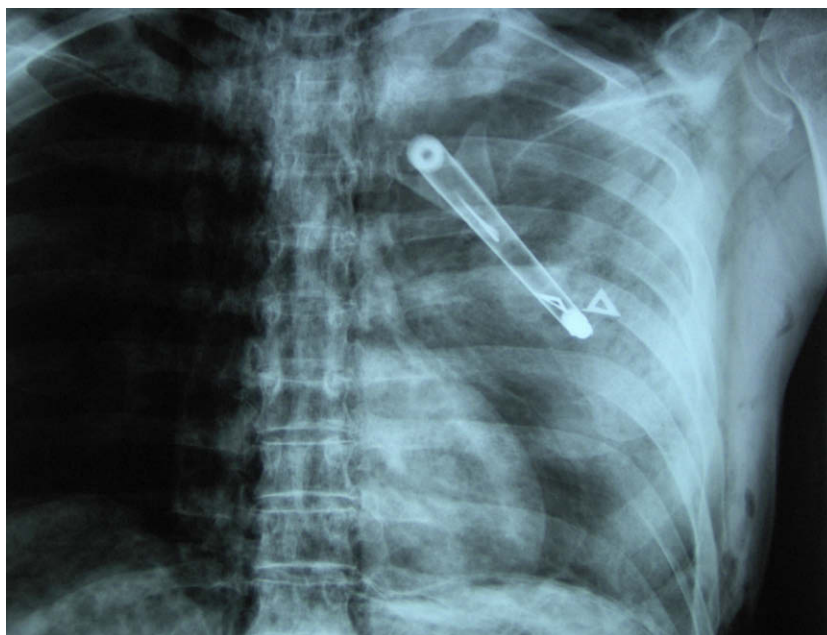


**Fig. 2.** Crossbow recovered from scene.

The structure and design of crossbows has undergone very little change over the centuries. Its basic structure consists of a bow with bowstrings, mounted on a shaft. There is a stock or 'butt' at the end of the shaft, which is used to stabilize the weapon upon the shoulder of the shooter. The weapon is discharged by depressing a trigger. Additions such as telescopic lenses are a modern adaptation to increase accuracy when fired [2]. The bolt is of a basic design, consisting of a shaft with vanes at the posterior end, and blades at the anterior point. These blades come in a wide variety of shapes, sizes and arrangements. In the case discussed by the author, there were three blades of 1.5 cm each arranged in a radial pattern, connected

to a tip with a sharp point. When fired, the initial velocity of the bolt varies from 40–60 m/s [3,4] to 80–100 m/s according to some sources [5]. This can be maintained to a distance of approximately 270 m [4].

Although rare, suicide and homicide by crossbow have been reported in the literature [6–11]. The vast majority of crossbow injuries and fatalities occur in males, although there is a report of a female who committed suicide by crossbow [7]. The body regions typically targeted are the head or thorax [7,11]. The traditional view was that crossbow injuries were caused by direct passage of the bolt through the body, and that there was no transfer of



**Fig. 3.** Anteroposterior radiograph showing bolt passage into the left thorax. Note the blades have broken away from the main shaft of the bolt. Radiographs such as this are useful for determining debris along the wound path, as well as aiding in the visualization of internal injury if an invasive autopsy is not to be performed.

kinetic energy to surrounding tissue, unlike bullet wounds. One study [8] examined the brains of two individuals who suffered fatal crossbow wounds to the head. Axonal and hypoxic injury was found not only in the bolt tract, but also in surrounding brain tissue, including the brainstem. This would suggest that despite the low velocity of the crossbow bolt, there is sufficient kinetic energy to cause diffuse axonal damage, which should be taken into account in the assessment of those with non-fatal crossbow injuries to the head.

Forensic investigation of crossbow injuries can be quite difficult, especially when the bolt has been removed from the body. As most victims will show some survival time after the injury, it is possible that the bolt may be removed by the victim themselves. As well, severe decomposition may alter the entrance wound and wound path. In these cases, careful examination of the clothing for the characteristics of the blade shape and arrangement should be made [9]. Post-mortem radiography should be utilized to determine if there is any debris in the wound path, such as the bolt blades (Fig. 3). A study by Downs et al. [12] gives suggestions on how to pursue crossbow death investigations. This includes detailed examination of the clothing for patterning of the bolt-head as well as radiography. As well, photography of the bolt in situ (if applicable) should be performed, followed by detailed photographs of the entrance and exit wound characteristics, after approximation of the edges. Photographs of clothing, weapon, and bolt should also be taken if possible.

#### Conflict of interest statement

There is no conflict of interest to this paper.

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#### Ethical approval

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